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TITLE

Improved Whirlpool Bath Filter and Suction Device

REFERENCE TO RELATED APPLICATION

U.S. Pat. No. 6,283,308 (2001) to Patil, *et al.*, U.S. Pat. No. 4,340,039 (1982) to Hibbard *et al.*, and U.S. Pat. No. 5,799,339 are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to combining a replaceable filter and a suction device in a closed loop home or hotel whirlpool bath, hydrotherapeutic baths, and other bathing receptacles.

BACKGROUND OF THE INVENTION

Whirlpool-type baths have been employed to treat discomfort resulting from strained muscles, joint ailments and the like. More recently, such baths have been used increasingly as means of relaxing from the daily stresses of modern life. A therapeutic effect is derived from bubbling water and swirling jet streams that create an invigorating to massage the user's body.

To create the desired whirlpool motion and hydro massage effect a motorized water pump draws water in through a suction fitting in a receptacle, such as a bathtub. The user first fills the bathtub. Then the user activates the closed loop whirlpool system. The water travels through a piping system and back out jet fittings. Jet fittings are typically employed to inject water at a high velocity into a

1 bathtub. Usually the jet fittings are adapted to aspirate
2 air so that the water discharged into the receptacle is
3 aerated to achieve the desired bubbling effect. (See for
4 instance, U.S. Pat. No. 4,340,039, incorporated herein by
5 reference).

6 Whirlpool baths currently do not have a filtration
7 system to filter debris in the water as do indoor and
8 outdoor spas. Whirlpool baths are designed as with a normal
9 bathtub to be drained after each use. However, debris in
10 the form of dead skin, soap, hair and other foreign material
11 circulates throughout the piping and pump system. This
12 debris does not completely drain and over time accumulates
13 in the piping system and may cause a health risk. Also hair
14 may get twisted and entrapped in the whirlpool bath pumps
15 impeller. Whirlpool bath manufactures for some time have
16 been trying to devise a way to incorporate a filtration
17 system on a closed loop whirlpool bath. The major obstacle
18 they face in using a filtration system for a whirlpool bath
19 is in complying with the plumbing codes. There is no
20 filtration system that is specifically designed for a drain
21 down whirlpool bath that allows a whirlpool bath to pass
22 requirements set forth by plumbing codes.
23 Another reason why there are no filtration systems for
24 Whirlpool bathtubs is because Whirlpool baths must meet
25 stringent drain downcode requirements set up by the American
26 Society of Mechanical Engineers (ASME). The code that
27 governs whirlpool baths is entitled "Whirlpool Bath
28 Appliances" (ASME A112.19.7M 1995). Section 5 of this code
29 covers water retention. It states the "whirlpool bath
30 appliances shall be of such design as to prevent retention
31 of water in excess of 44 ml. (1½ fl oz) for each jet and

1 suction filter. The average whirlpool bath has a 6-jet
 2 system and has one suction fitting. This system
 3 configuration can only retain 10½ ounces of water in the
 4 complete whirlpool bath system after draining to meet code.
 5 This is for a six jet one suction whirlpool bath. Most
 6 quality whirlpool baths retain less than 4 ounces of water
 7 in the whirlpool bath system after draining. Therefore, the
 8 filter part of the system cannot retain over six and a half
 9 ounces of water, because the total water retention would
 10 exceed 10½ ounces. These requirements for whirlpool baths
 11 fall under the American Society of Mechanical Engineers code
 12 entitled "Whirlpool Bathtub Appliances." Currently there
 13 are no known filtration systems designed for whirlpool
 14 baths. Currently there are no known filtration systems
 15 designed for whirlpool baths that retain less than 6 1/2
 16 ounces of water except for the present invention.

17 Another important consideration in developing a
 18 filtration system for whirlpool baths is the ease of
 19 replacing the filter. It needs to be designed so the filter
 20 can be replaced from inside the bath. This way access
 21 panels on the underside of the whirlpool bath to access the
 22 filter can be eliminated. The most logical choice for a
 23 filter location is in the suction fitting. Placing the
 24 filter in the suction fitting presents a whole other range
 25 of design concerns. First placing a filter in the suction
 26 fitting might cause undue stress on the pump motor. The
 27 suction filter must pass the codes set up by ASME for
 28 suction. The code for suction from ASME is titled Suction
 29 Fittings for use in swimming pools, spas, hot tubs, and
 30 whirlpool bathtub appliances (ASME/IAMPO reaffirm 1996).
 31 There are a variety of load and structural tests the

1 suctions have to pass. The present invention provides a
 2 cavity that houses a filter that could be installed to have
 3 the filter replaced from the inside of a whirlpool bath.
 4 The complete filtration system retains less than 4 ounces of
 5 water and as little as 2 ounces of water; so most whirlpool
 6 bath companies could use it on their whirlpool bath models
 7 and pass the drain down codes for whirlpool baths. The
 8 filter had to be made small to meet the drain down
 9 requirements. However, since it was small it had to be very
 10 efficient. The present invention has a specially designed
 11 filter core. The core is engineered with varying spaced and
 12 sized holes along the length of the core. This design
 13 allows water to be drawn through just about the entire
 14 filter. Without this design the filter would only pull
 15 water through about 20% of the filter near the outlet.

16 The present invention also provides a new face
 17 plate cover. This cover has to be easily removable. It
 18 also has to pass the heavy load, impact and hair entrapment
 19 tests set out by ASME/IAMPO. One cover embodiment has a
 20 radius and back ribbing on it and a removable insert support
 21 to pass the strength tests. The preferred embodiment
 22 faceplate is flat with structural fins on its back side,
 23 thus eliminating the removable insert. Each cover has just
 24 the right amount of sized holes to pass the hair entrapment
 25 tests. The result is the fluid suction filter device that
 26 is especially made just for whirlpool baths.

27 U.S. Pat. No. 4,340,039 (1982) to Hibbard et al.
 28 discloses a hydromassage apparatus for a whirlpool bath
 29 system. It has a closed loop water circulation system,
 30 adjustable nozzles and venturi air injector, (incorporated
 31 herein by reference).

1 U.S. Pat. No. 4,637,873 (1987) to DeSousa et al.
 2 discloses a front load skimmer type filter for spas and
 3 pools. A skimmer housing supports a polyester fabric filter
 4 having pleated filter media and a central polyvinyl chloride
 5 (PVC) pipe with a porous core, a solidified potting compound
 6 for a solid top, and an open bottom. It does not support a
 7 series of expanding diameter holes for the porous core as
 8 does the present invention, (incorporated by reference). It
 9 does not meet draindown requirements of ASME for whirlpool
 10 baths as does the present invention. It does not meet the
 11 ASME requirements for suction fittings and therefore needs
 12 to operate in conjunction with a below the waterline
 13 suction.

14 U.S. Pat. No. 4,349,434 (1982) to Jaworski discloses a
 15 filtration system piped in away from a pool, spa, hot tub
 16 and the like. A filter cartridge and filter is used.

17 U.S. Pat. No. 4,359,790 (1982) to Chalberg discloses a
 18 three piece whirlpool bath suction outlet assembly.

19 U.S. Pat. No. 6,283,308 (2001) to Patil et al.
 20 discloses a bacteriostatic filter cartridge having elements
 21 impregnated with an anti-microbial agent.

22 U.S. Pat. No. 6,038,712 (2000) to Charlberg et al.
 23 discloses a whirlpool bath suction device with a cavitation
 24 assembly to cause the pump to lose its prime when hair
 25 blocks the faceplate.

26 U.S. Pat. No. 5,799,339 (1998) to Perry et al.
 27 discloses a suction device for a spa or jetted tub with a
 28 turbulence reduction design to reduce the possibility of
 29 entangling a user's hair in the faceplate.

30
 31

SUMMARY OF THE INVENTION

The main aspect of the present invention is to provide in a whirlpool bath a suction fixture and replaceable filter combination apparatus.

Another aspect of the present invention is to provide a safety plate for the suction intake which resists hair entrapment.

Another aspect of the present invention is to provide a pop off suction faceplate and a pop out filter core to provide safety features to prevent drowning.

Another aspect of the present invention is to provide a safety/sanitation port to cause cavitation if the filter is absent or improperly inserted.

Another aspect of the present invention is to provide a minimal water retention filter to retain less than 6 1/2 ounces of water after draindown.

Another aspect of the present invention is to provide a housing which is readily retrofitable and/or incorporated into a new whirlpool bath that retains minimal water.

Other aspects of this invention will appear from the following description and appended claims, reference being made to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

The housing of the suction filter is generally rectangular having a length of four inches to two feet. A semi-cylindrical recess extends behind the installation wall of the tub. The recess surrounds a disposable cylindrical fiber filter which has a support tube in its core. The support tube has a plurality of water holes having increasing diameters extending away from the water outlet.

1 These holes provide for a water flow along the entire length
2 of the filter, instead of just making use of the filter at
3 the outlet and of the filter.

4 The housing has a sloped lower shelf and slots to allow
5 water to drain back into the tub after shutdown. The
6 housing has a sharp radius end opposite the outlet end, thus
7 allowing the housing to be fitted into the side wall of a
8 tub through a standard size opening cut.

9 The housing mounting flange has nominally 6-10 counter
10 sunk holes for bolting to the tub via standard nuts and
11 bolts. Silicone is used on the back of the housing flange
12 to prevent leaks.

13 The original faceplate shown in FIG. 4 slides into the
14 housing to provide for filter replacement. The faceplate
15 has a radius shape to prevent a limb from being sucked up
16 against it which could entrap a body part. ASME hair
17 entrapment standards are met using a plurality of slots or
18 holes. Impact and load tests are met.

19 In the preferred embodiment faceplate shown in FIG. 25
20 support bars are now built into the faceplate and fit into
21 receiving slots in the housing. This creates a solid part
22 and allows it to pass impact and load tests called out by
23 ASME code. This is the only suction for whirlpool bathtubs
24 that is designed for the structured supports to be removed
25 after the suction is installed and allows a filter to be
26 installed in the suction housing or replaced and still pass
27 these test. All other known suctions have the main
28 structured support as part of the body (housing) and these
29 supports cannot be removed. See U.S. Pat. No. 5,799,339
30 which represents all other known suctions. FIG. 5 of U.S.
31 Pat. No.5,799,339 shows a face view of the support. FIG. 3

1 shows how FIG. 5 screws in permanently into body 20 of FIG.
2 3. These supports (26b, 28b called a guide) cannot be
3 removed once the suction is installed.

4 The preferred faceplate is larger than standard
5 faceplates because of the size of the removable filter. The
6 combination of a filter and a suction in a single device is
7 not known in the prior art. The faceplate now has slots to
8 allow a larger volume of water to pass through it. Because
9 of the increased size of the faceplate the slots have to be
10 designed and engineered in a radiating pattern. This is
11 very important for the plastic injected molding process.
12 With the present design over a horizontal (see '339 patent)
13 or vertical design, the pressure of the injected plastic
14 from the injection point of the mold, (usually the injection
15 point of a mold is located in the center of the mold) hits
16 the small end of the slots instead of the wide end of the
17 slots. The shorter end of the slot can withstand a great
18 deal more pressure over time before failure than if the
19 pressure were subjected to the wide side of the slots. This
20 allows for much longer mold life and a more pleasing
21 finished product. The radiating pattern of slots gives a
22 straight-line flow to the outer edge of the faceplate part.
23 Pat. 5,799,339 FIG. 4 shows a standard slot opening
24 arrangement that represents the arrangement of slots used by
25 manufacturers of slotted face faceplates. U.S. Pat. No.
26 6,038,712 FIG. 2 shows circular hole openings which
27 represents how other faceplates are made. Slots are
28 preferable over circular holes to increase flow.

29 The preferred embodiment housing eliminates the drain
30 down slots of the original design because water now
31 evacuates through the bottom slots of the faceplate. The

1 filter core ID is preferably 2" to allow for 200 GPM flow.
2 No other manufacturer makes a filter for whirlpool bathtubs
3 or a filter that fits into a housing outlet that has a 2"
4 ID. Without this ID you would not be able to get 200 GPM to
5 run through the filter core allowing a combination filter
6 suction an overall 200 GPM rating and meets ASME entrapment
7 requirements.

8 The filter core also has two slots cut into the end
9 that fits into the outlet of the housing. The housing has
10 two male ridges. This makes the preferred filter core the
11 only filter core that fits the preferred housing. The core
12 is designed with varying sized holes and slots. The holes
13 furthest from the outlet port are larger than the holes near
14 the outlet port. This allows water to pull through the
15 entire filter.

16 The male ridges align a gasket to cover a
17 safety/sanitation port. The core when inserted into the
18 outlet port side of the filter covers the safety/sanitation
19 port, a hole opening that has a plastic tube attached. If
20 the filter were removed or if a person tried to operate the
21 unit without the filter core covering this hole, air from
22 the tube would be drawn into the pump and the pump would
23 cavitate (draw more air than water). The whirlpool bathtub
24 would not operate properly, and people would turn it off.
25 The importance to this is no user would run the unit without
26 the filter in place. The feature reduces the chance of
27 drawing contaminants into the whirlpool bath system. Once
28 contaminants such as hair are entrapped in the pumps
29 impeller, the entire whirlpool bath system becomes
30 contaminated until someone opens the whirlpool bath pump (a
31 long and time consuming process usually requiring a

1 professional), frees the entrapped hair and sanitizes the
2 complete system.

3 Right now by code, every suction faceplate must be
4 engineered so the faceplate cannot be removed without using
5 a tool. See Pat. 6,038,712 FIG. 2 that shows screw hole
6 openings and Pat. 5,799,339 FIG. 3 number 22 that shows the
7 screw. All known suctions on the market use a form of screw
8 or the like to attach the faceplate to the housing. There
9 are some suction manufacturers that have a cavitation device
10 in the faceplate of the suction, see Pat. 6,038,712. If the
11 face of the suction is restricted significantly, the unit
12 cavitates and the suction against the faceplate decreases.
13 These designs are still dangerous. Hair can still become
14 twisted in the faceplate before the unit shuts down. Once
15 the hair is trapped, you need a tool by code to take the
16 faceplate off. In most cases a screwdriver to remove the
17 screw. The entrapped hair traps the head of the user
18 underwater in the tub water. People still can drown with
19 these devices. The reason for this code of needing a tool
20 to remove the faceplate is that if the faceplate of current
21 suctions are removed, body parts or hair could get trapped
22 in the exposed housing support cross members that are an
23 integral part of the suction body (nonremovable). Since the
24 preferred embodiment suction filter will not operate without
25 the filter in place, there is no need for the screw. If the
26 filter were in place and someone did get their hair caught
27 in the preferred faceplate, the faceplate is held in place
28 by magnets; and the whole faceplate pops off easily. If
29 hair got caught in the exposed filter if the unit were run
30 without the faceplate cover, the filter also pops out
31 easily. There is no chance of getting entrapped if the

1 filter is removed, because the unit cavitates and ceases the
2 suction action and trigger no obstructions in the outlet for
3 anything to become entrapped

4 The filter core has a gasket that slides over the
5 safety/sanitation port which is a cavitation hole. Without
6 this gasket, the replaceable plastic filter core would rub
7 against the plastic housing outlet and could cause wear over
8 the years to the housing outlet.

9 The faceplate now preferably attaches to the housing
10 with magnets.

11 The screw hole openings of the housing are recessed for
12 flush mounting. They also are flat recessed.

13 The filter media is preferably made out of
14 polypropylene. Others in the spa industry use polyester
15 media No one has an approved filtration system for
16 whirlpool baths, so filters are not used on whirlpool baths.
17 Polypropylene media can be treated in the manufacturing
18 process with antibacterial agents, whereas polyester media
19 cannot be treated effectively with antibacterial agents.

20 The preferred filter is designed to retain less than 3
21 ounces of water.

22 The suction filter housing is installed by using screws
23 to attach it to the whirlpool bathtub. No other suction
24 currently uses screws for installation. All other suctions
25 currently place the housing behind the hole-opening cut into
26 the sidewall of the whirlpool bathtub, and a separate
27 threaded base '339 number 14 is screwed into the housing
28 forming the installation. By using screws the present
29 invention eliminates this extra plastic injected part.

30 The preferred housing is the only known housing that
31 has sloped sides of the inner wall to allow water to drain

1 back into the whirlpool bathtub when the whirlpool bathtub
2 system is deactivated whether the unit is installed facing
3 left or right.

4 The present suction filter device could be designed in
5 other configurations than its current rectangular form. The
6 unit could also be designed in a round form or any other
7 shape or size. The filter and filter core could also be
8 made shorter, longer, larger or smaller. The filter could
9 be made smaller for less money to be disposable after each
10 whirlpool bath use. The filter could even be designed in
11 such a way to be incorporated into existing suction with
12 modification of those suction. The filter media that
13 filters the water could be pleated or wrapped without
14 pleating around a filter core.

15 The housing could be designed to incorporate multiple
16 filters. The ridges and slots at the end of the filter core
17 could be made in a variety of shapes or locations to ensure
18 the use of only one filter.

19 The main body housing could be vacuum formed and become
20 an integral part of the whirlpool bathtub.

21 The magnets holding the faceplate to the housing could
22 be larger or smaller and arranged in various other locations
23 on each part. The amount of magnets used could be increased
24 or decreased. The faceplate could also be attached using
25 various snap-on configurations. An installation-sealing
26 gasket could be used. The slope in the sidewalls of the
27 housing could be increased or decreased. The overall size
28 of the suction filter could be increased or decreased.

29 The housing body, faceplate or filter core could be
30 made from other material than injected plastic; it could be
31 stamped or machined out of metal or other material.

1 The radiating slotted design of the faceplate could
2 have a radiating round hole design.

3 The safety cavitation hole could be placed anywhere
4 rearward on the outlet of the housing and be various sizes
5 or have multiple openings.

6 The filter could have various sanitizing materials in
7 its core such as slow dissolving chlorine tablets or other
8 sanitizing material incorporated into the filter core.

9 The screw and nuts that attach the housing to the
10 sidewall of the whirlpool bathtub could have a washer or use
11 locking nuts or clips and have varying sizes and be made out
12 of a variety of materials, including plastic and nylon or
13 some space age material.

14 The faceplate back support ribbing is designed in an X
15 pattern, which offers outstanding structural integrity. The
16 circular ribbing adds tremendous strength to the center
17 impact point of the faceplate.

18 The faceplate is designed to protrude less than 1/2" into
19 the tub when attached to the housing. This streamline
20 design protrudes much less than most current suction adding
21 more room to the bathing area of the whirlpool bathtub.

22 The slotted holes on the top, sides and bottom of the
23 faceplate extend out keeping in line with the radiating
24 design pattern on the face of the faceplate. This makes it
25 an easier part to inject with plastic.

26 The housing has a flange that provides a resting area
27 for the peripheral ledge of the faceplate when the faceplate
28 is attached to the housing. This resting area allows for
29 weaker magnets to be used to keep the faceplate attached to
30 the housing.

1 When a conventional suction fitting is operated under a
2 high flow rate, the water flow inside of the fitting can
3 become turbulent or can vortex like a tornado. When the
4 water flow through such a fitting becomes turbulent or
5 vortexes, hair extending through the faceplate of the
6 fitting can become entangled within the fitting, thereby
7 rendering the hair difficult to remove from the fitting.
8 Accordingly, the conventional fitting cannot pass the five-
9 pound pull test at high flow rates.

10 The present invention filter inside the housing
11 disrupts this vortex. Tests have proved that the GPM
12 actually increase with the filter installed by eliminating
13 these vortexes than running the same test with the filter
14 removed. Less vortex results in less of a chance someone
15 could get his or her hair twisted in the faceplate and
16 entrapped. Therefore, another feature of the present
17 invention is to help provide a laminar flow through the
18 suction/filter.

19,

20 **BRIEF DESCRIPTION OF THE DRAWINGS**

21 FIG. 1 is a top perspective view of a whirlpool bath
22 having an alternate embodiment of the suction filter
23 installed therein.

24 FIG. 2 is a top perspective view of the original
25 faceplate of the suction filter as viewed from the inside of
26 the whirlpool bath shown in FIG. 1.

27 FIG. 3 is an exploded view of the suction filter shown
28 in FIG. 2.

29 FIG. 4 is a back plan view of the faceplate shown in
30 FIG. 2.

1 FIG. 5 is a top perspective view of another alternate
2 embodiment faceplate.

3 FIG. 6 is a back perspective view of the housing of the
4 suction filter shown in FIG. 2.

5 FIG. 7 is a plan view of the original porous core of
6 the filter.

7 FIG. 8 is the same view as FIG. 7 with the original
8 porous core rotated 90° clockwise.

9 FIG. 9 is the same view as FIG. 8 with the porous core
10 rotated another 90° clockwise.

11 FIG. 10 is a longitudinal sectional view of the housing
12 and filter of FIG. 2.

13 FIG. 11 is a longitudinal sectional view of an
14 alternate embodiment filter having a charcoal bag in the
15 porous core.

16 FIG. 12 is a cross sectional view taken along line 12-
17 12 of FIG. 11.

18 FIG. 13 is a plan view of the outlet end of the
19 original housing.

20 FIG. 14 is a top perspective view of the original
21 housing with an optional mounting bracket for the filter.

22 FIG. 15 is an exploded view of another alternate
23 embodiment housing and faceplate design for a suction filter
24 apparatus.

25 FIG. 16 is a perspective exploded view of the FIG. 15
26 embodiment.

27 FIG. 17 is a rear perspective view of the FIG. 15
28 faceplate.

29 FIG. 18 is a rear perspective view of the FIG. 15
30 housing.

1 FIG. 19 is a right side plan view of an installed FIG.
2 15 embodiment.
3 FIG. 20 is a top perspective view of the preferred
4 embodiment filter core.
5 FIG. 21 is a perspective view with a partial cutaway of
6 the FIG. 15 housing, the preferred filter core and showing
7 the ridge/slot alignment of the filter core inside the
8 housing outlet.
9 FIG. 22 is a longitudinal sectional view taken along
10 line 22-22 of FIG. 15.
11 FIG. 23 is a vertical sectional view taken along line
12 23-23 of FIG. 15.
13 FIG. 24 is a top perspective view of a user getting his
14 or her hair entrapped in the preferred embodiment
15 faceplate/housing design, wherein only the magnets hold the
16 faceplate to the housing, thereby enabling a safety oriented
17 pop off faceplate as well as a safety oriented pop off
18 filter core.
19 FIG. 25 is a top perspective view of the preferred
20 embodiment pop-off faceplate/housing shown in FIG. 24.
21 FIG. 26 is an exploded view of the preferred embodiment
22 suction/filter.
23 FIG. 27 (prior art) is an exploded view of a suction
24 device 10P.
25 FIG. 28 (prior art) is a front plan view of the cover
26 12P of the suction device 10P.
27 FIG. 29 is an exploded view of a suction/filter 2700,
28 an alternate embodiment.
29 FIG. 30 is a side plan view of the cover 12PP of the
30 suction filter 2700.

1 Before explaining the disclosed embodiment of the
2 present invention in detail, it is to be understood that the
3 invention is not limited in its application to the details
4 of the particular arrangement shown, since the invention is
5 capable of other embodiments. Also, the terminology used
6 herein is for the purpose of description and not of
7 limitation.

8

9

Detailed Description of Drawings

10 Referring first to FIG. 1 a whirlpool bath 1 has a tub
11 5 with a standard faucet and spicket assembly 6 and a
12 standard tub drain 8. During whirlpool use the no two
13 called out pump 2 circulates water via output pipe 4, air
14 mixing pipe 10 and jets 11. Water is drawn from the filled
15 tub via pump inlet pipe 3 which is connected to the suction
16 filter 9, an alternate embodiment. A switch 7 activates the
17 pump 2.

18 Referring next to FIGS. 2,3,4 the suction filter 9 is
19 shown as seen by a bather in the tub in FIG. 2. The jets 11
20 are prior art. The only visible portion of the suction
21 filter 9 is a the faceplate 20. The faceplate 20 is
22 preferably rectangular but could have any shape. The
23 faceplate 20 has a peripheral mounting flange rim 29 which
24 has receiving grooves 23,24 to slidingly engage L shaped
25 brackets 25,26. The brackets 25,26 are molded into the
26 mounting flange 30 of the filter housing 31.

1 The faceplate 20 has a raised convex center 27 which is
2 perforated with a plurality of inlet holes 21 to allow the
3 recirculating water to enter the filter housing 31. The
4 rear of the faceplate 20 has support ribs 22 to strengthen
5 the center 27 to prevent crushing. Hair entrapment is
6 prevented typically in a 1 - 1 ½ inch piping system flowing
7 at about 50 gallons per minute with a hole pattern of about
8 25 holes per square inch at about .25 inches O.D.

9 The filter housing 31 has mounting holes 32 on its
10 mounting flange 30 for attachment to the inner wall of the
11 tub 5 via bolts (not shown), wherein silicone is used behind
12 the mounting flange 30.

13 The floor 35 of the filter housing 31 slopes downward
14 into the drain slots 36,37,38.

15 The replaceable filter 40 has a standard fibrous,
16 folding membrane 43 supported at its outlet end by an outlet
17 cap 41 and at its closed end by an end cap 42. The porous
18 core 44 is preferably an ABS pipe mountable in filter
19 housing outlet 39. The holes range from small 45 at the
20 outlet end to large 46 at the closed end adjacent the end
21 cap 42. The slots also range from small 47 to large 48 in a
22 similar fashion, wherein the increasing hole and slot sizes
23 from the outlet end distribute the water flow across the
24 entire length of the membrane 43. Without the hole and slot

1 enlarging feature, the water would only be filtered by a
2 small portion of the membrane near the outlet 39.

3 Referring next to FIG. 5 an alternate embodiment filter
4 housing 50 has a flange 51 with receiving holes 52 for bolts
5 53 which mount a faceplate 54 to the flange 51. Multiple
6 holes 55,52 may be used. All other features of the assembly
7 59 are the same as the FIG. 4 embodiment.

8 Referring next to FIG. 6 the filter housing 30 is seen
9 to have an arcuate top rear and rear wall 31 generally
10 shaped like a semi-cylinder when integrated with the floor
11 35 (also called a trapezoid shape). The relatively sharp
12 radius R allows the housing 31 to be readily installed into
13 a standard size opening cut or formed into the sidewall of
14 the tub, by tilting the housing sideways to allow the outlet
15 39 to fit.

16 Referring next to FIGS. 7,8,9 the porous core 44 has an
17 outlet end 70 and a remote end 71. The holes and/or slots
18 at the remote end 71 are larger than the holes and/or slots
19 at the outlet end 70. Also slot groups M,N,O,P,Q have
20 ascending values of slot numbers as they approach the remote
21 end.

22 FIG. 10 shows how the outlet end 70 of the porous core
23 44 fits into the outlet 39 of the filter housing 31.

24 FIGS. 11,12 show an alternate embodiment filter
25 assembly 115 having a charcoal bag filter and/or a chlorine
26 time release pellet, and/or a bromine time release pellet
27 and/or any chosen anti-microbial agent 111 in the center of

1 the porous core 110 and remote from the outlet end. The
2 crosshairs 112 of the core 110 prevent the bag from entering
3 the outlet 39, wherein the outlet end 700 fits into the
4 outlet 39 the same as the preferred embodiment.

5 FIG. 13 shows an outlet end plan view of the preferred
6 embodiment.

7 Referring next to FIG. 14 an alternate embodiment
8 housing 310 has inside notches 141 to receive a U shaped
9 brace 140.

10 Referring next to FIGS. 15,16 a suction/filter 1500
11 consists of a housing 1501 and a faceplate 1502. The
12 housing 1501 is designed to mount flush with a whirlpool
13 bathtub sidewall adjacent the bottom of the bathtub. Water
14 flows into the suction/filter 1500 in direction FI and out
15 the outlet port 1503 in direction FO. The radiating slot
16 pattern 1504 provides for a high flow rate as well as
17 facilitating an injection molding process that allows the
18 molten plastic to migrate radially from a central injection
19 point. The slots extend into the peripheral edge 1701 of
20 the faceplate 1502 as shown by number 1505. The slots 1506
21 along the bottom edge of the faceplate allow the water to
22 drain out of the housing 1501 in direction DRAIN. This
23 drain function occurs when the whirlpool system is shut off.
24 Proper draining is a key element for water return control as
25 called out by ASME code. Both the top and the bottom of the
26 housing 1501 are sloped as indicated by angle α , which may
27 be about 10° , thereby facilitating draining. The housing
28 1501 can be installed with the outlet port pointing left or
29 right, so the top T and the bottom B are symmetrical to
30 provide proper draining in either orientation.

31 A disposable filter 1507 is supported by a filter core
32 1508 shown in FIG. 22. To change the disposable filter
33 faceplate 1502 must be removed. This FIG. 15 embodiment

1 secures the faceplate 1502 to the housing 1501 with magnets
2 1509 and 1510 (see FIG. 17). A screw 1511 is also used to
3 fit through hole 1512 and lock into either screw boss 1513
4 or 1514, depending on the orientation of the housing 1501.

5 The suction/filter 1500 must pass an ASME heavy load
6 and impact test to prevent a user from breaking the
7 faceplate 1501 which could cause body entrapment. The
8 housing has a plurality of grooved retainers 1515 which
9 receive the structural fins 1516 which are best seen in FIG.
10 17.

11 For attachment to the bathtub wall bolts 1517 are
12 provided which fit into recessed holes 1518.

13 Referring next to FIG. 17 the back of the faceplate
14 1502 is shown. A central hub 1700 offers structural support
15 for the radiating structural fins 1516. The lengths of each
16 structural fin 1516 may differ as may quantity. The
17 peripheral edge 1701 of the faceplate 1502 forms a support
18 ledge 1702 around the peripheral edge 1703 of the housing
19 1501.

20 Referring next to FIG. 18 the back of the housing 1501
21 is shown. The mounting bolts 1517 have nuts 1800. The
22 outlet port 1503 has two alignment ridges 1801, 1802 which
23 function to align the receiving grooves 1803, 1804 as shown
24 in FIG. 20. A safety/sanitation port 1803 is connected to a
25 tube 1804 which has an open end 1805 that is located at a
26 height h which is above the waterline of the whirlpool bath.
27 If the filter core 1508 is either missing from or improperly
28 seated in the outlet port 1503, then the pump's action pulls
29 AIR down the tube 1804, thereby causing cavitation. This
30 cavitation stops the whirlpool action of the system by
31 inhibiting water suction. The safety/sanitation port 1803
32 forces the user to always operate the whirlpool with a
33 proper filter properly installed.

1 Referring next to FIG. 19 the housing 1501 is shown
2 bolted to the sidewall 1900 of a whirlpool bath. The
3 placement is close to the bottom 1901 of the whirlpool bath.

4 Referring next to FIG. 20 a filter core 1508 has the
5 same hole pattern as the embodiment shown in FIGS. 7,8,9.
6 The holes 2009 distal to the outlet port 1503 are smaller
7 than the holes 2001 proximal to the outlet port to force the
8 water through the entire length of filter 1507. The filter
9 core 1508 has a mounting collar 1805. The mounting collar
10 1805 has a recess 1806 which holds a gasket 1807 in contact
11 with the safety/sanitation port 1803 to seal the
12 safety/sanitation port 1803 during use. The gasket 1807 may
13 be welded and/or glued into the recess 1806. The receiving
14 slots 1803, 1804 align the collar 1805 with alignment ridges
15 1801, 1802.

16 Referring next to FIG. 21 the alignment of the recess
17 1806 (gasket 1807 is not shown) with the entry port 2100 of
18 the safety/sanitation port 1803 is shown.

19 Referring next to FIG. 22 the gasket 1807 is seen
20 sealing the entry port 2100 of the safety/sanitation port
21 1803.

22 Referring next to FIG. 23 the faceplate 1502 is shown
23 mounted to the housing 1501 in a sectional view. The
24 support ledge 1702 is shown overlapping the entire
25 peripheral edge 1703 of the housing 1501. In the preferred
26 embodiment shown in FIGS. 24,25 the screw 1511 and screw
27 boss 1513 are deleted. Then the faceplate 1502 is held in
28 place only with the support ledge 1702 and the magnets 1509,
29 1510.

30 Referring next to FIGS. 24,25 the preferred embodiment
31 suction/filter 2499 is shown. The faceplate 2402 no longer
32 has a mounting hole. Otherwise it is identical to the FIG.

1 15 embodiment. The housing 2420 no longer has screw bosses.
2 Otherwise it is identical to the FIG. 15 embodiment.

3 In operation a user 2400 may get his or her hair 2401
4 sucked into the faceplate 2402 and entangle both the
5 faceplate 2402.

6 The preferred embodiment suction/filter 2499 protects
7 the user from drowning in the whirlpool by providing a pop
8 off faceplate 2402 which is only held in place by small
9 magnets 1509,1510. Additionally the filter 1507 and filter
10 core 1508 pop out based on the choice of forming a narrow
11 collar 1805 as well as sloping the outlet wall W inward an
12 angle SW which may be about 4° as shown in FIG. 15.

13 Referring next to FIG. 26 an improved filter core 2600
14 has an additional feature of a cage 2601 built into the
15 hollow internal section of the body. A chemical anti-
16 microbial time release tablet 2603 can be inserted between
17 2601 and 2602, the end cap of the filter cartridge. The
18 tablet 2603 augments the germ killing properties of the
19 entire system.

20 The filter core 1508 and/or filter 1507 can be made to
21 include the anti-microbial features of U.S. Pat. No.
22 6,283,308. The filter combination 1507/1508 would include a
23 wet laid polypropylene membrane, inner perforated core
24 member and yarn and an impregnation of at least one of these
25 components of a non-leaching anti-microbial agent selected
26 from the group consisting of 2,4,4-trichloro-2-hydroxy
27 diphenol ether and 5-chloro-2phenol (2,4 dichlorophenoxy)
28 compounds.

29 Referring to FIGS. 27,28 a prior art (U.S. Pat. No.
30 5,799,339) suction device 10P is shown. The safety cover
31 assembly is generally referred to by the reference numeral
32 10P, and includes a cover 12P, a threaded base 14P, a gasket
33 16P, a threaded collar 18P, an elbow fitting 20P, a

1 stainless steel screw 22P and a name plate 24P. As will be
 2 described below, the cover 12P and the base 14P have
 3 interior walls that act as cooperating guide vanes 26BP and
 4 28BP to advantageously reduce turbulence and vortexing of
 5 the water passing through the safety cover assembly 10P.
 6 Thus, the guide vanes 26BP and 28BP allow the safety cover
 7 assembly 10P to handle high flow rates of approximately 200
 8 gallons per minute while simultaneously reducing the
 9 likelihood that hair from a user will become entangled
 10 inside the cover assembly 10P. The guide vanes 26BP and
 11 28BP enable the safety cover assembly 10P to have a
 12 relatively small size and yet pass the five pound pull test
 13 at high flow rates. The guide vanes 26BP and 28BP also
 14 advantageously increase the structural integrity of the
 15 safety cover assembly 10P.

16 The cover 12 of the preferred assembly 10P has a
 17 generally square face wall 30P and four sidewalls 32P
 18 (collectively referred to as sidewall), all with holes 34P
 19 formed therein for water flow therethrough. The total area
 20 of the holes 34P in the sidewalls 32P is greater than that
 21 of the holes 34P in the face wall 30P which are, in turn,
 22 greater than the area of a hole 36P in the base 14P, which
 23 mates with a suction drain. The holes 34P in the cover 12P
 24 are arranged in the aforementioned manner so that the water
 25 flow through the cover 12P is uniformly low, thereby
 26 reducing the suction force adjacent to the cover 12P and
 27 reducing the likelihood that the suction force will cause an
 28 object to become lodged against either the face wall 30P or
 29 sidewalls 32P of the cover 12P.

30 Because the center 38P of the face wall 30P is an area
 31 that would have a high fluid intake flow, the center 38P of
 32 the face wall 30P is solid. This solid center section 38P
 33 evens out the water flow across the rest of the face wall

1 30P so that there are no areas of high flow that would
2 create unwanted areas of high suction force.

3 Guide vanes 26BP and 28BP are integrally formed on the
4 underside of the cover 12P. The guide vanes 26BP and 28BP
5 are at right angles to each other and extend between
6 opposite sidewalls 32P of the cover 12P. The guide vanes
7 26BP and 28BP do not obstruct any of the holes 34P formed in
8 the face and sidewalls of cover 12P. The advantageously
9 prevents hair from entering the same hole and becoming
10 entangled by wrapping around both sides of a guide vane.
11 Where the guide vanes 26BP and 28BP intersect, a hole
12 through the cover 12P is provided for the mounting screw
13 22P. The two guide vanes 26BP and 28BP on the underside of
14 the cover 12P are sized to engage with and align with the
15 guide vanes 26BP and 28BP on the base 14P, which is
16 described below.

17 Guide vane 26BP extends from the face wall 30P of the
18 cover 12P toward base 14P. Guide vanes 26BP and 28BP divide
19 the cover 12P into four portions. The total area of the
20 holes 34P in each position of the cover 12P equals the total
21 area of the holes 34P in each other portion of the cover
22 12P. Each portion of the cover 12P includes a portion of
23 the face wall 30P and a portion of the sidewall 32P of the
24 cover 12P. The total area of the holes in the portion of
25 the sidewall 32P being greater than the total area of the
26 holes in the portion of the face wall 32P.

27 The preferred base 14P has a generally square upper
28 surface. The upper surface of the base 14P is sized to mate
29 with the sidewalls 32P of the cover 12P to form a fluid
30 intake chamber 50P inside of the assembly 10P between the
31 cover 12P and the base 14P. The base 14P has an externally
32 threaded end 52P sized to threadedly engage the collar 18P
33 to mount the assembly 10P to the wall 54P of a jetted tub or

1 spa. The gasket 16P is sized to fit around the threaded end
 2 52P of the base 14P and abut the rear surface of the base
 3 14P. The wall 54P of the jetted tub would be located
 4 between this gasket 16P and the threaded collar 18P. The
 5 gasket 16P can be made of an elastometric material to
 6 cushion impacts upon the fitting 10P. The components of the
 7 assembly 10P can be made of ABS plastic or polycarbonate
 8 material by well known injection molding techniques.

9 A first end 56P of the elbow fitting 10P fits inside
 10 the collar 18P and can be attached by adhesive, as is well
 11 known in the art. The other end 58P of the elbow fitting
 12 10P can be connected to a suction drain of a water
 13 circulation system that requires a relatively high rate of
 14 intake water flow.

15 The invention shown in FIGS. 29,30 modify the cover 12P
 16 with the features of cover 12PP. The new suction filter is
 17 denoted 2700. Cover 12PP has four slots 59P along the four
 18 quadrants of the peripheral edge 3000 of the cover 12PP.
 19 Each slot 5PP receives a disposable filter 60P. Each
 20 disposable filter 60P consists of a plastic rim 3001 and a
 21 filter element 3002. Quadrant dividers 61P provide support
 22 for the disposable filters 60P, so they don't get sucked
 23 into the fluid intake chamber 50P. All other components of
 24 the suction 10P are present in the suction/filter 2700. One
 25 skilled in the art could use the FIG. 29 invention technique
 26 to apply a similar design to any know suction device.

27
 28

Nominal Dimensional Measurements Are:

1			
2			
3	d1	5.40	inches
4	d2	12.77	inches
5	d3	.25	inches (O.D.)
6	d4	Blank	
7	d5	Blank	
8	d6	3.50	inches
9	d7	6/32	inches (O.D.)
10	d8	11/32	inches (O.D.)
11	d9	Blank	
12	d10	Blank	
13	d11	.17	inches (O.D.)
14	d12	2.27	inches (O.D.)
15	d13	R5.0	inches (Radius)
16	d14	4/32	inches (O.D.)
17	d15	9/32	inches (O.D.)
18	d16	10.00	inches

19 Although the present invention has been described with
20 reference to preferred embodiments, numerous modifications
21 and variations can be made and still the result will come
22 within the scope of the invention. No limitation with
23 respect to the specific embodiments disclosed herein is
24 intended or should be inferred.

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